

We Claim:

1. An arrangement comprising:

a channel code encoder responsive to an applied input signal,

a space-time encoder responsive to output signal of said channel code encoder; and

a modulator responsive to said space time-encoder.

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2. The arrangement of claim 1 further comprising pulse shaping circuitry and at

least two antennas for transmitting a space-time coded signal created by said space-time
encoder and modulated by said modulator.

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3. A transmitter comprising:

a demultiplexer responsive to an applied input signal for developing a plurality of
at least two signal streams, and

a like plurality of channel coding/space-time coding transmitters, each responsive
to a different signal stream of said plurality of signal streams.

15 4. The transmitter of claim 3 where each of said channel coding/space-time coding
transmitters comprises:

a channel coder of rate R_i ,

a space-time encoder responsive to output signal of said channel code encoder,

a modulator responsive to said space time-encoder,

pulse shaping circuitry responsive to said modulator, and

20 at least two antennas for transmitting a space-time coded signal created by said
space-time encoder, modulated by said modulator, and conditioned by said pulse shaping
circuitry.

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30 5. The transmitter of claim 4 where said demultiplexer develops an L plurality of
signal streams, where said channel coders in said L channel coding/space-time coding
transmitters develop rates R_i $i=1,2,\dots,L$, that are not identical to each other.

6. The transmitter of claim 4 where said demultiplexer develops an L plurality of

Sub B1
 signal streams, where said channel coders in said L channel coding/space-time coding transmitters develop rates R_i $i=1,2,\dots,L$, that are such that $R_1 > R_2 > \dots > R_L$.

Sub A1 7. The transmitter of claim 1 where said channel code encoder performs trellis 5 encoding.

~~8. The transmitter of claim 1 where said channel code encoder performs convolutional encoding.~~

10 9. A receiver comprising:
 a detector of space-time coded signal; and
 a decoder for decoding a channel code encoded signal that is embedded in output signals of said detector.

15 10. The receiver of claim 9 where said detector employs a MMSE IC decoder.

Sub A2 11. The receiver of claim 9 where said detector employs a two step algorithm to develop a weights vector for canceling interfering signals from terminals other than a given terminal whose signal is being detected.

20 12. The receiver of claim 11 where said two step algorithm is:

$$(\hat{\mathbf{c}}, \hat{\mathbf{s}}) = \text{II. DECODE}(\mathbf{r}_1, \mathbf{r}_2, \mathbf{H}_1, \mathbf{H}_2, \mathbf{G}_1, \mathbf{G}_2, \Gamma)$$

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$$(\hat{\mathbf{c}}_o, \Delta_{c,o}) = \text{MMSE. DECODE}(\mathbf{r}_1, \mathbf{r}_2, \mathbf{H}_1, \mathbf{H}_2, \mathbf{G}_1, \mathbf{G}_2, \Gamma)$$

$$\mathbf{x}_1 = \mathbf{r}_1 - \mathbf{H}_1 \cdot \hat{\mathbf{c}}_o \quad , \quad \mathbf{x}_2 = \mathbf{r}_2 - \mathbf{H}_2 \cdot \hat{\mathbf{c}}_o$$

$$f(\mathbf{s}) = \|\mathbf{x}_1 - \mathbf{G}_1 \cdot \mathbf{s}\|^2 + \|\mathbf{x}_2 - \mathbf{G}_2 \cdot \mathbf{s}\|^2$$

$$\hat{\mathbf{s}}_o = \arg \min_{s \in \mathbf{S}} (f(s)) \quad , \quad \Delta_{s,o} = f(s)$$

$$(\hat{\mathbf{s}}_1, \Delta_{s,1}) = \text{MMSE. DECODE}(\mathbf{r}_1, \mathbf{r}_2, \mathbf{G}_1, \mathbf{G}_2, \mathbf{H}_1, \mathbf{H}_2, \Gamma)$$

$$\mathbf{y}_1 = \mathbf{r}_1 - \mathbf{G}_1 \cdot \hat{\mathbf{s}}_1 \quad , \quad \mathbf{y}_2 = \mathbf{r}_2 - \mathbf{G}_2 \cdot \hat{\mathbf{s}}_1$$

$$f(\mathbf{c}) = \|\mathbf{y}_1 - \mathbf{H}_1 \cdot \mathbf{c}\|^2 + \|\mathbf{y}_2 - \mathbf{H}_2 \cdot \mathbf{c}\|^2$$

$$\hat{\mathbf{c}}_1 = \arg \min_{c \in \mathbf{C}} (f(c)) \quad , \quad \Delta_{c,1} = f(c)$$

If $(\Delta_{c,o} + \Delta_{s,o}) < (\Delta_{c,1} + \Delta_{s,1})$

$$(\hat{\mathbf{c}}, \hat{\mathbf{s}}) = (\hat{\mathbf{c}}_o, \hat{\mathbf{s}}_o)$$

Else

$$(\hat{\mathbf{c}}, \hat{\mathbf{s}}) = (\hat{\mathbf{c}}_1, \hat{\mathbf{s}}_1)$$

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13. The receiver of claim 9 where said decoder for decoding a channel code is a trellis decoder.

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14. The receiver of claim 9 where said decoder for decoding a channel code is a convolutional decoder.

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